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A GRASS-KILLING SLIME MOULD.

By JOHN W. HARSHBERGER, Ph.D.

(Read November 3, 1906.)

It has been known for a number of years that the club root, or finger and toe disease of cabbage, radish, turnip and other cruciferous plants is due to a slime mould (*Plasmodiophora brassicæ* Wor.) which gains entrance to the root region of the host plant.¹ Each spore gives rise to an amœboid cell which with other similar cells lives in the roots of the host in a truly parasitic manner, finally destroying the cells which it inhabits. These amœboid cells cause great stimulation of the tissues of the host which enlarge to form large swellings, and the plant, as a result, fails to head out. The roots soon decay and the spores which have formed in the cells of the host are again set free. A somewhat similar disease described by Toumey² is called crown gall and is found at the base of young cherry, plum, peach and apricot trees throughout the United States. The amœboid cells that are formed from the spores enter the stem tissues of the host at the crown (a point where stem and root join) and produce there hypertrophied tissue known as crown gall. Minced galls, if used to inoculate healthy trees, will communicate the disease. This slime mould which produces true sporangia within the dead tissues of the host differs from the one on cruciferous plants and has been named *Dendrophagus globularis*. In both of these cases, the plasmodium exists in symbiosis with the protoplasm of the host plant as a mycoplasma, and this mycoplasma can be distinguished after treatment with osmic acid, which differentiates it.

On August 11, 1905, my attention was called to a lawn in Cynwyd, Montgomery County, Pa., the grass of which had been destroyed in spots by what the owner, Mr. H. P. Gardner thought

¹ Frank, Dr. A. B., "Die Krankheiten der Pflanzen," II, 14-18; Sorauer, Dr. Paul, "Handbuch der Pflanzen-Krankheiten," II, 64-72.

² Toumey, J. W., "An Inquiry into the Cause and Nature of Crown Gall," Arizona Agricultural Experiment Station Bulletin 33, April 13, 1900.

to be a fungous disease. It seems that the trouble began eight or ten days before the above date after some showers at night, little patches of blackened grass appearing on the lawn in the morning. In a few days, these black patches, if disturbed with the foot or a stick, gave off little clouds of dark brown spores. The original patches were small and few in number, from six to twelve inches in diameter and of irregular shape. The rains and damp weather of early August, 1905, aggravated the injury to the lawn, for the patches spread over much larger areas and covered portions of lawn twenty-five feet in diameter, of irregular outline, with smaller patches scattered in the circumscribed space. The disease not only occurred in Cynwyd, but also on some lawns along the main line of the Pennsylvania Railroad. Subsequently Mr. Gardner informed me that only the blades of lawn grasses were destroyed, for after the disease had disappeared, leaving the aerial green portions of the grasses dead, the grass over the above mentioned patches regained its fresh, bright green color, proving that the plasmodium of the slime mould had not penetrated to the rootstocks (rhizomes) or to the roots.

Specimens were sent to me and an examination showed the presence of numerous sporangia of a slime mould, which I determined to be *Physarum cinereum* Pers. The blades of grass were killed by the plasmodium of this myxomycete spreading across the surface of the lawn. It is a well-known fact that in damp weather a plasmodium may grow with considerable rapidity, so as to cover areas of large superficial extent. Such a plasmodium, when active, constantly advances over the substratum by a slow amoeboid movement, assuming as it goes a reticulate appearance with numerous pseudopodia extending in many directions out from the margin. As it moves it incorporates many organic substances as food, as I have previously shown,¹ and the dejectamenta is left behind in the form of a slimy detritus on the surface of the substratum. The plasmodium of *Physarum cinereum* Pers. which caused the destruction of the grass blades is a watery, white one found usually among dead leaves in the woods. In the above instance, it left its saprophytic habit, assuming a grass-killing one. The sporangia which are

¹ Harshberger, John W., "Observations upon the Feeding Plasmodia of *Fuligo septica*," *Botanical Gazette*, XXXI, 198-203, March, 1901.

subsequently formed are sessile, subglobose, oblong, scattered or crowded and confluent, 0.3 to 0.5 mm. broad, white or cinereous, more or less warted, or veined. The sporangial wall is membranous with innate clusters of white lime granules. A columella is absent, or it is represented by confluent lime knots. The capillitium consists of branching hyaline threads with numerous white lime-knots varying in size and shape, sometimes confluent in the center, or forming a network with a few hyaline threads. The spores are bright violet-brown, almost smooth, or spinulose, 7 to 10 μ diameter. In conclusion, it may be stated that *Physarum cinereum* Pers. has been collected in England, France, Germany, Natal, Ceylon, Madras, Pennsylvania, Iowa, South Carolina, Cuba and Paraguay, usually on dead leaves. The occurrence of its plasmodium and sporangia on living grass leaves is, therefore, of interest and merits the attention that it has received in the above description of how it has changed its saprophytic habit into a grass-killing one.

Stated Meeting November 2, 1906.

President SMITH in the Chair.

The decease was announced of Mr. Cadwalader Biddle, at Philadelphia on October 28, 1906, æt. 69.

The following papers were read:

"The Decorative Art of British New Guinea," by DR. ALFRED C. HADDON, F.R.S., which was discussed by MR. LESLIE M. MILLER.

"The Effect of Sulphuric Acid on the Deposition of Metals when using a Mercury Cathode and Rotating Anode," by LILY G. KOLLOCK and EDGAR F. SMITH. (See page 255.)

"The Use of a Rotating Anode in the Electrolytic Precipitation of Uranium and Molybdenum," by EDGAR J. WHERRY and EDGAR F. SMITH. (See page 268.)

"A Grass-killing Slime Mould," by DR. JOHN W. HARSHBERGER. (See page 271.)